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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/905,736	07/13/2001	Roger L. Frick	30203/37263	5345

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MARSHALL, GERSTEIN & BORUN  
6300 SEARS TOWER  
233 SOUTH WACKER  
CHICAGO, IL 60606-6357

EXAMINER

ABUTAYEH, MOHAMMAD

ART UNIT PAPER NUMBER

2873

DATE MAILED: 11/26/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/905,736

Applicant(s)

FRICK ET AL.

Examiner

Mohammad Abutayeh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-48 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27-43 and 46-48 is/are allowed.
- 6) ☒ Claim(s) 1, 3-5, 8, 11, 14, 15, 17, 20, 22, 23, 25, 44, and 45 is/are rejected.
- 7) ☒ Claim(s) 2, 6, 7, 9, 10, 12, 13, 16, 18, 19, 21, 24 and 26 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 13 July 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).  
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_ 6) ☒ Other: *Detailed Action*.

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to because Figures 1-14 include illegible handwritings and are not very clear. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Specification***

2. The disclosure is objected to because of the following informalities: the blank spaces on Page 6, Lines 18-19 need to be filled out with the serial number and the filing date of the specified application. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claim 1, 3-5, 8, 11, 14, 15, 17, 20, 22, 23, 25, 44, and 45 rejected under 35 U.S.C. 103(a) as being unpatentable over Bloom et al. (US Patent No. 5,311,360) in view of Asakawa et al. (US Patent No. 5,892,598).

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Bloom et al. discloses, as in Claim 1, an optical switch (Figures 3 and 4) comprising: a substrate (Figures 3 and 4, 16) for transmitting an optical signal within the substrate, where the optical signal propagates in the substrate in a first direction; and a diffractive optical element (Figures 3 and 4, 18) disposed above a top surface of the substrate and moveable relative thereto between a first position (Figures 3) substantially out of evanescent field coupling with the optical signal, such that the optical signal continues to travel in the first direction, and a second position (Figures 4) in evanescent field coupling with the optical signal to alter the propagation of the optical signal into a second direction. Bloom et al. does not disclose that the first direction of the optical signal is under total internal reflection, but within the same field of invention, Asakawa et al. discloses the total internal reflection propagation in waveguides (Column 11, Lines 2-8). It would have been obvious for one skilled in the art, at the time the invention was made to use total internal reflection to propagate the optical signal as described by Asakawa et al. in the optical switch described by Bloom et al. for the purpose of minimizing signal loss.

Bloom et al. in view of Asakawa et al. discloses, as in Claim 3, the optical switch of Claim 1, wherein the diffractive optical element is a holographic optical element (Asakawa et al.: Column 11, Lines 18-19).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 4, the optical switch of Claim 1, wherein the diffractive optical element is formed of a plurality of strips (Bloom et al.: Figure 1d, 18) forming a diffraction grating, where each strip has a

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substantially equal width and where each of the strips are spaced apart a substantially equal spacing (Bloom et al.: Column 3, Lines 31-35).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 5, the optical switch of Claim 4, wherein the width is substantially identical to the spacing (Bloom et al.: Column 5, Lines 26-37).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 8, the optical switch of Claim 4, wherein the strips are flexible for moving the diffractive optical element between the first position and the second position (Bloom et al.: Column 6, Lines 30-41).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 11, the optical switch of Claim 4, wherein the strips (Bloom et al.: Figure 1d, 18) are biased in the second position, and wherein an electrode (Bloom et al.: Figure 1d, 22) is disposed adjacent the strips for moving the strips into the first position.

Bloom et al. in view of Asakawa et al. discloses, as in Claims 14 and 15, the optical switch of Claim 4, wherein the strips are formed of a material selected from the group consisting of amorphous silicon, crystalline silicon, alumina, sapphire ( $\text{Al}_2\text{O}_3$ ), silicon nitride, poly-silicon, and a poly-silicon/poly-germanium alloy (Bloom et al.: Column 4, Lines 7-10).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 17, the optical switch of Claim 4, wherein the strips have a thickness above 1 micron (Bloom et al.: Column 5, Lines 41-45).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 20, the optical switch of Claim 1, wherein the diffractive optical element is in physical contact with the top surface of the substrate when in the second position as illustrated in Figure 4 (Bloom et al.: Column 9, Lines 46-51).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 22, the optical switch of Claim 1, wherein the optical signal is reflected off the top surface of the substrate, as shown in Figure 6 of Asakawa et al., under total internal reflection (Asakawa et al.: Column 11, Lines 2-8).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 23, the optical switch of Claim 1, wherein the optical signal is reflected off the top surface and a bottom surface of the substrate, as shown in Figure 6 of Asakawa et al., under total internal reflection (Asakawa et al.: Column 11, Lines 2-8).

Bloom et al. in view of Asakawa et al. discloses, as in Claim 25, the optical switch of Claim 1, wherein the diffractive optical element operates by total internal reflection (Asakawa et al.: Column 11, Lines 2-8).

Bloom et al. discloses, as in Claim 44, a 1XN optical switch (Figures 3 and 4) comprising: a substrate (Figures 3 and 4, 16) for transmitting an optical signal within the substrate, where the optical signal propagates in the substrate in a first direction; and N diffractive optical elements (Figures 3 and 4, 18) disposed above a top surface of the substrate and each individually moveable relative to the substrate between a first position (Figures 3) substantially out of evanescent field coupling with the optical signal, such that the optical signal continues to travel in the first direction, and a second

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position (Figures 4) within evanescent field coupling with the optical signal to alter the propagation of the optical signal into a second direction. Bloom et al. does not disclose that the first direction of the optical signal is under total internal reflection, but within the same field of invention, Asakawa et al. discloses the total internal reflection propagation in waveguides (Column 11, Lines 2-8). It would have been obvious for one skilled in the art, at the time the invention was made to use total internal reflection to propagate the optical signal as described by Asakawa et al. in the optical switch described by Bloom et al. for the purpose of minimizing signal loss.

Bloom et al. in view of Asakawa et al. discloses, as in Claim 45, the 1XN optical switch of Claim 44, wherein each diffractive optical element is formed of a plurality of strips (Bloom et al.: Figure 1d, 18) forming a diffraction grating, where each strip has a substantially equal width and where each of the strips are spaced apart a substantially equal spacing (Bloom et al.: Column 3, Lines 31-35).

***Allowable Subject Matter***

5. Claims 2, 6, 7, 9, 10, 12, 13, 16, 18, 19, 21, 24, and 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The following is a statement of reasons for the indication of allowable subject matter: the prior art does not disclose the limitations of the claims in such a manner that a rejection under 35 USC 102 or 35 USC 103 would be proper.

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The prior art fails to reveal an optical switch where signals propagate in two directions depending on the position of a movable diffractive element disposed on top of a substrate such that: the substrate is made from quartz and sapphire as described in Claim 2, the second direction propagates the signal under total internal reflection as described in Claim 21, the diffractive element is made from a substantially transparent material as described in Claim 24, or the diffractive element is basically a grating made up of several strips with varying width and spacing distance as described in Claim 26.

The prior art fails to reveal an optical switch where signals propagate in two directions depending on the position of a movable diffractive grating made up of several equally-spaced strips having the same width disposed on top of a substrate such that: the grating period is equal to the propagating light's wavelength as described in Claim 6, the grating period is between one half to three times the propagating light's wavelength as described in Claim 7, the flexible strips are suspended from an anchor mounted to the substrate as described in Claim 9, the flexible strips are suspended from two anchors mounted to the substrate as described in Claim 10, the strips are perpendicular to a line bisecting an angle between the planes containing the input and output signals as described in Claim 12, cross connections are included between the strips as described in Claim 13, the index of refraction of the strips is greater than that of the substrate as described in Claim 16, or the thickness of the strips is chosen such to maximize the intensity of the signal in the second direction as described in Claims 18 and 19.



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6. Claims 27-43 and 46-48 are allowed. The following is a statement of reasons for the indication of allowable subject matter: the prior art taken either singularly or in combination fails to anticipate or fairly suggest the limitations of the claim(s), in such a manner that a rejection under 35 U.S.C. 102 or 103 would be proper.

The prior art fails to teach a combination of all the claimed features as presented in Claims 27-43, wherein the claimed invention is a holographic optical element that comprises a substrate, where a light signal propagates, and a number of movable transparent strips disposed on the substrate determining in which direction should the light signal propagate.

The prior art fails to teach a combination of all the claimed features as presented in Claims 46-48, wherein the claimed invention is an optical switch where signals propagate in two directions depending on the position of several spaced-apart strips disposed on top of a substrate.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Conclusion***

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohammad Abutayeh whose telephone number is 703-605-0726. The examiner can normally be reached on Monday thru Friday 8:00 am -

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5:00 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Georgia Y. Epps can be reached on 703-308-4883. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7724 for regular communications and 703-308-7724 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 800-786-9199.



MA

November 20, 2002

Mohammad Abutayeh  
Examiner  
Art Unit 2873



Georgia Epps  
Supervisory Patent Examiner  
Technology Center 2800